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Effect of titanium dioxide nanoparticles on oxidative stress mediated cellular damage in rat brain

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The ever increasing applications of engineered nanoparticles cause serious concerns about its potential health risks on living beings. Regulatory health risk assessment of such particles has become mandatory for the safe use of nanomaterials in consumer products and medicines. In order to study the mechanisms underlying the effects of TiO₂ nanoparticles (nano-TiO₂) on the brain, Wistar rats were administrated intravenously with nano-TiO₂ (21 nm) of various doses through the caudal vein for 30 days at weekly interval. Then, the various parameters such as coefficient of the brain, the brain pathological changes and oxidative stress-mediated responses, the bioaccumulation of nano-TiO₂, level of neurochemicals in brain etc. were measured. Results from present study show that the concentration of nano-TiO₂ in the brain was increased with the increases in nano-TiO₂ dosages. The oxidative stress and injury of the brain occurred as nano-TiO₂ appeared to trigger a cascade of reactions such as lipid peroxidation, decreases the activities of antioxidative enzymes and melatonin level, overproduction of reactive oxygen species, the reduction of glutamic acid, downregulated levels of acetylcholinesterase activities, and the increase in caspase-3 activity (a biomarker of apoptosis), DNA fragmentation and apoptosis. It is concluded that nano-TiO₂ may cross the blood brain barriers and induces oxidative stress, which may cause genotoxicity such as oxidative DNA damage, micronuclei induction and cell apoptosis in brain cells of Wistar rat. These changes may affect the health of living beings.

Biography

Ramovatar Meena has completed his PhD from Jawaharlal Nehru University, New Delhi. He is continuing his research with Dr. Paulraj Rajamani. He has received BSc (Agri. Hons) from Maharana Pratap University of Agricultural Sciences, Udaipur and MSc (Agri. Biotechnology) from Marathwada Agriculture University, Parbhani, Maharashtra, India. His field of research is Nanoparticles synthesis and their biomedical applications. Presently he is working on *in-vitro* and *in-vivo* effects of various metal oxide nanoparticles. He has published more than 10 papers in the reputed International Journals.

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